Fire and Smoke Initiative

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National Oceanic and Atmospheric Administration | Joint Polar Satellite System (JPSS)

PGRR Background

JPSS PGRR Background Definitions

- **Proving Ground**
  - Demonstration and utilization of data products by the end-user operational unit, such as a NWS Weather Forecast Office or Modeling Center.
  - Promote outreach and coordination of new products with the end users, incorporating their feedback for product improvements
- **Risk Reduction**
  - Development of new research and applications to maximize the benefits of JPSS satellite data
    - Example - use of Day Night Band for improved fog and low visibility products at night, benefiting transportation industry.
  - Encourages fusion of data/information from multiple satellite, models and in-situ data
  - Primary work is done at the algorithm and application developer's institution.
  - Address potential risk in algorithms and data products by testing alternative algorithms.

JPSS PGRR Background

- The PGRR Program was established in early 2012, following the launch of the Suomi National Polar Partnership (SNPP) satellite on 28 Oct 2011

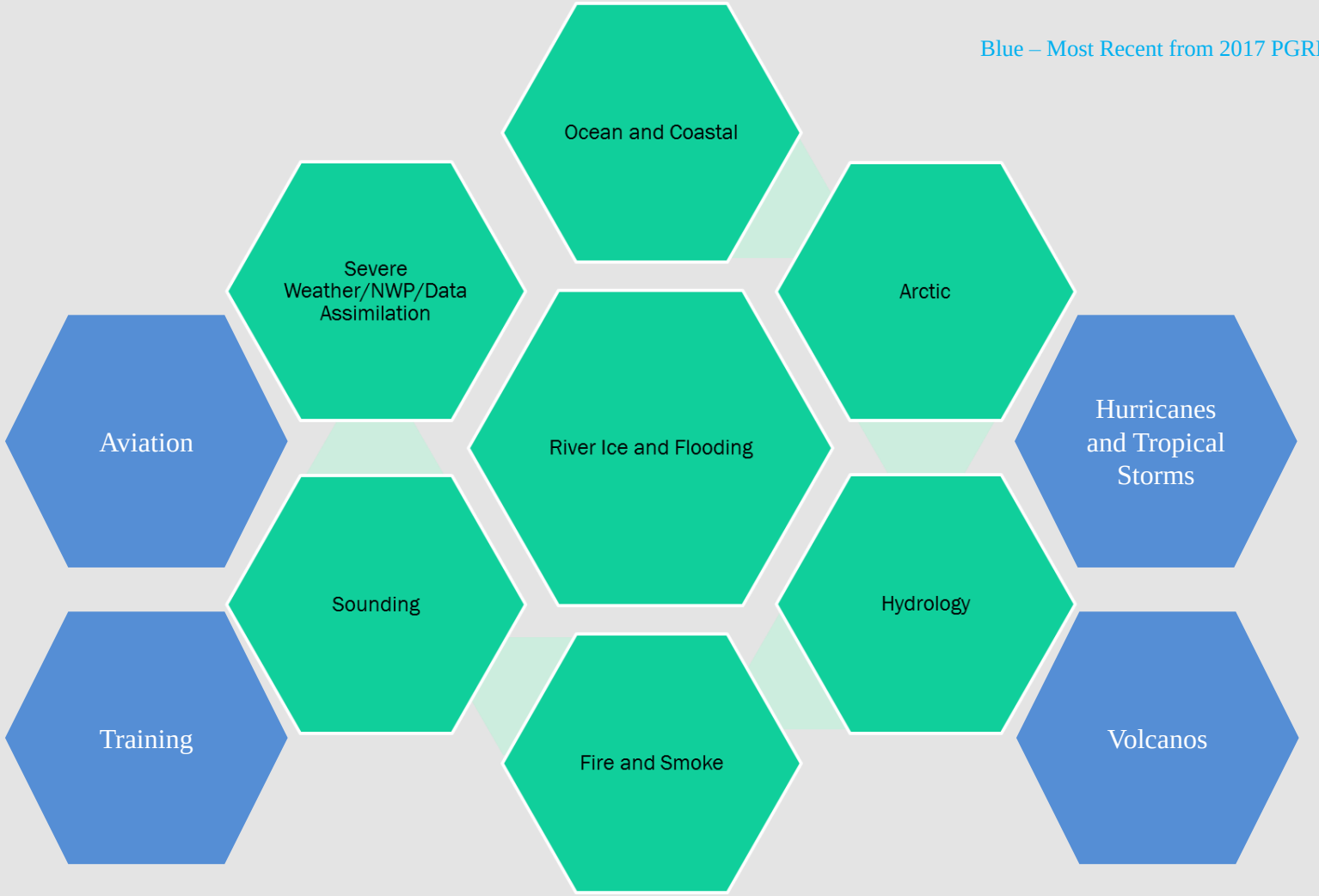
- CFP 2012: 100 teams providing Letters-of-Intent (LOIs) with nearly 40 projects selected for funding
- CFP 2015: PGRR Initiatives were used as a focus for the responses to this CFP. Over 130 LOIs were received.
- CFP 2017: Sent out in Oct 2017. Over 130 LOIs received and funding selections recently made

PGRR Proving Ground Initiatives Responding to User Feedback

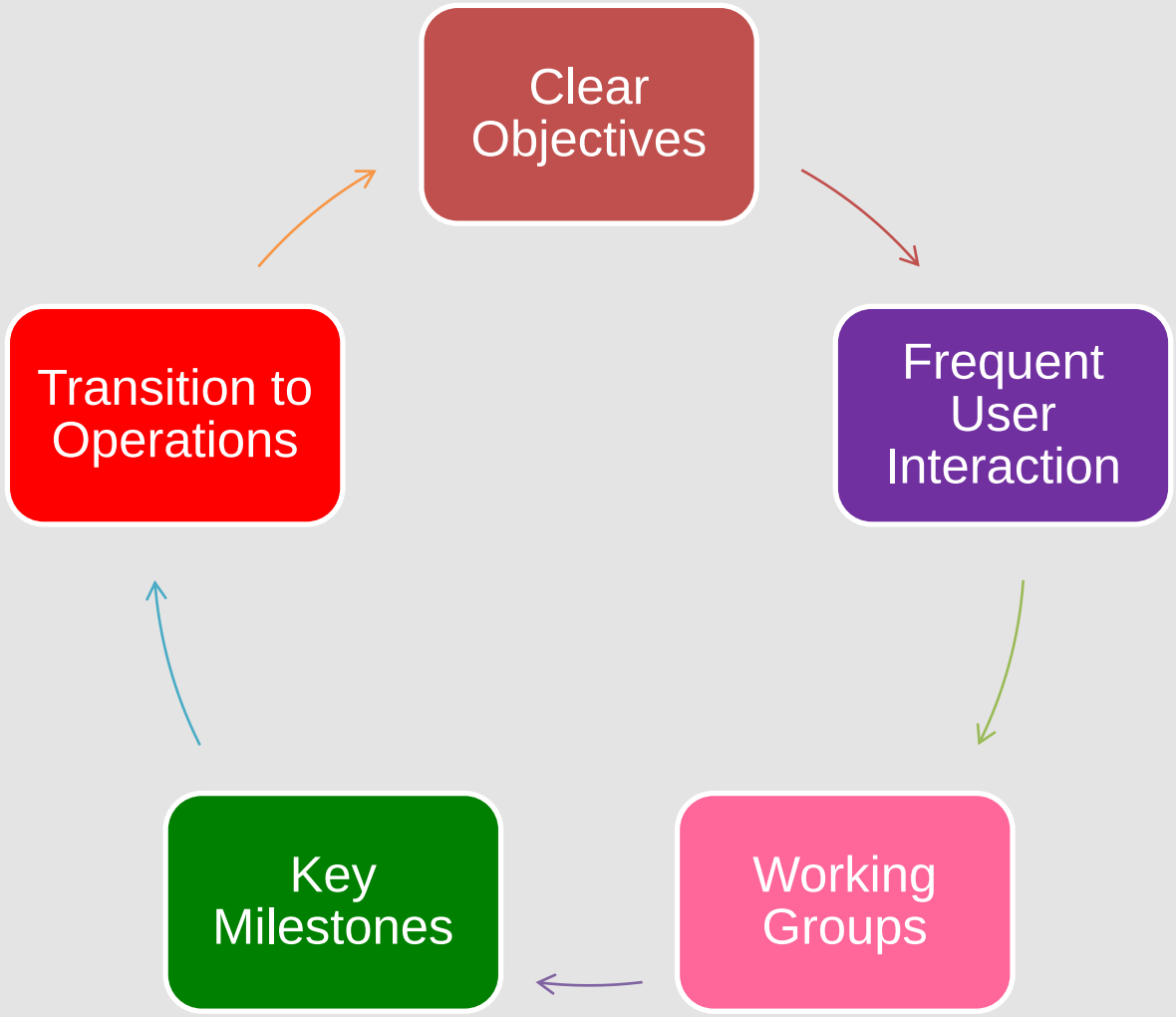
- The River Ice and Flooding Initiative was the first attempt at this new partnership and it was established in response to Galena AK flooding in May 2013.
- The Initiative included River Ice and River Flooding Project teams, direct broadcast SMEs, and National Weather Service River Forecast Center forecasters.
- The success of River Ice and Flooding Initiative led to creation of other initiatives that guided the 2014 PGRR CFP.
- Initiatives have proven to be critical forums where JPSS personnel, product developers, and users interact. The effort is to evaluate current and future JPSS Capabilities in operational environments to determine which of these capabilities should be transitioned to operations.

PGRR Initiatives List

Blue – Most Recent from 2017 PGRR CFP



PGRR Proving Ground Initiatives Best Practices



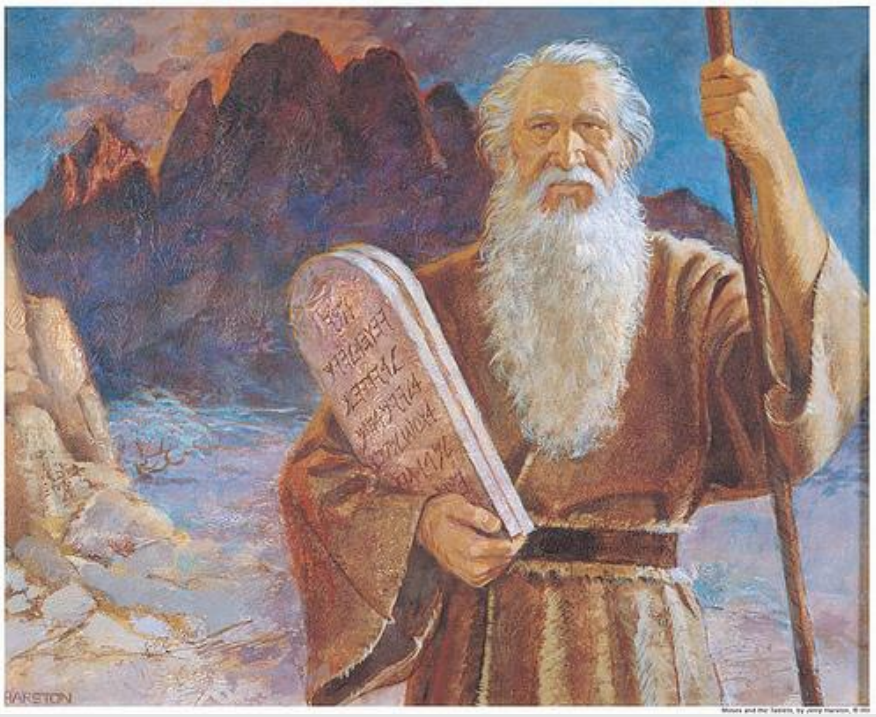
PGRR Proving Ground Initiatives Partners

PGRR Initiatives

Initiative	Start Date
River Ice and Flooding	November 2013
Fire and Smoke	May 2014
Sounding Applications NOAA Unique CrIS/ATMS Processing System (NUCAPS)	July 2014
Hydrology	July 2015
Ocean and Coastal	March 2016
Severe Weather/NWP/Data Assimilation	March 2016
Arctic Initiative	June 2016
Hurricanes and Tropical Storms Initiative	June 2018
Aviation Initiative	June 2018
Training Initiative	June 2018
Volcano Initiative	June 2018

JPSS and the Fire Mission

How the Fire and Smoke Initiative Began



We must find a way to deal effectively with fire events and smoke forecasts!

Andy Edman NWS WR SSD Chief

Fire and Smoke Initiative Objectives

- Organize a forum to allow stakeholders supporting Fire and Smoke products development to interact with key users of the capabilities.
- Understand the current use of geostationary and polar orbiting satellite capabilities in support of Fire and Smoke detection and forecasting mission
- Identify current SNPP/JPSS and new GOES-R Fire and Smoke data and capabilities with the potential to improve support to this mission
- Establish methodologies and procedures for the operational demonstrations of these capabilities
- Following these operational demonstrations, identify the satellite capabilities whose operational impacts are sufficient to warrant transition from research to operations
- Determine required actions for an effective transition of these capabilities to operations that can be maintained over the long term.
- As the Initiative Team met over the months and years, actions were taken to implement these objectives, and new objectives were identified and worked.

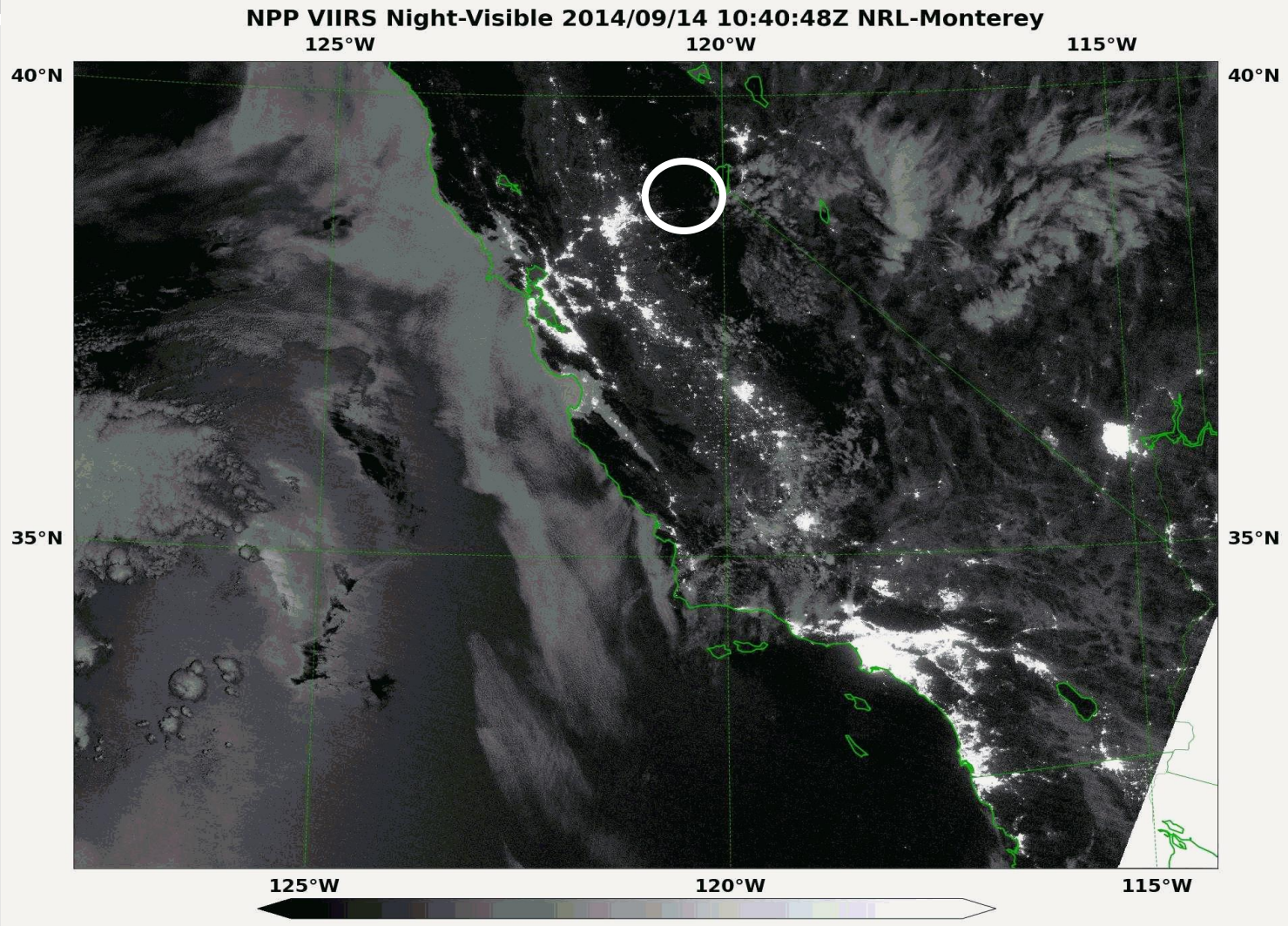
Typical Telecon Participants

Name	Organization	Name	Organization	Name	Organization
Raman Ahmadov	CIRA	Chad Kahler	NWS Western Region	Brad Pierce	STAR
Bret Anderson	US Forest Service	Hyun Kim	NOAA Air Resources Lab	Julie Price	JPSS
Nazmi Chowdhury	JPSS	Adam Kochanski	Univ of UT	Pete Roohr	NWS
Russell Dengel	CIMSS	Mark Loeffelbein	NWS – Western Region	Katherine Rowden	NWS – Service Hydro Spokane
Evan Ellicott	UofMD	Jan Mandel	Univ of CO - Denver	Scott Rudlosky	CICS
Rick Graw	US Forest Service	Jeff McQueen	NCEP	Bill Sjoberg	JPSS
Robyn Heffernan	NWS	Matt Mehle	NWS	Jebb Stewart	ESRL
Amy Huff	PSU	Brian Motta	NWS	William Straka	CIMSS
Eric James	CIRES	Susan O'Neill	USFS	Jason Taylor	NESDIS
Pedro Jimenez	UCAR	Li Pan	OAR	Jorel Torres	JPSS Training Liaison

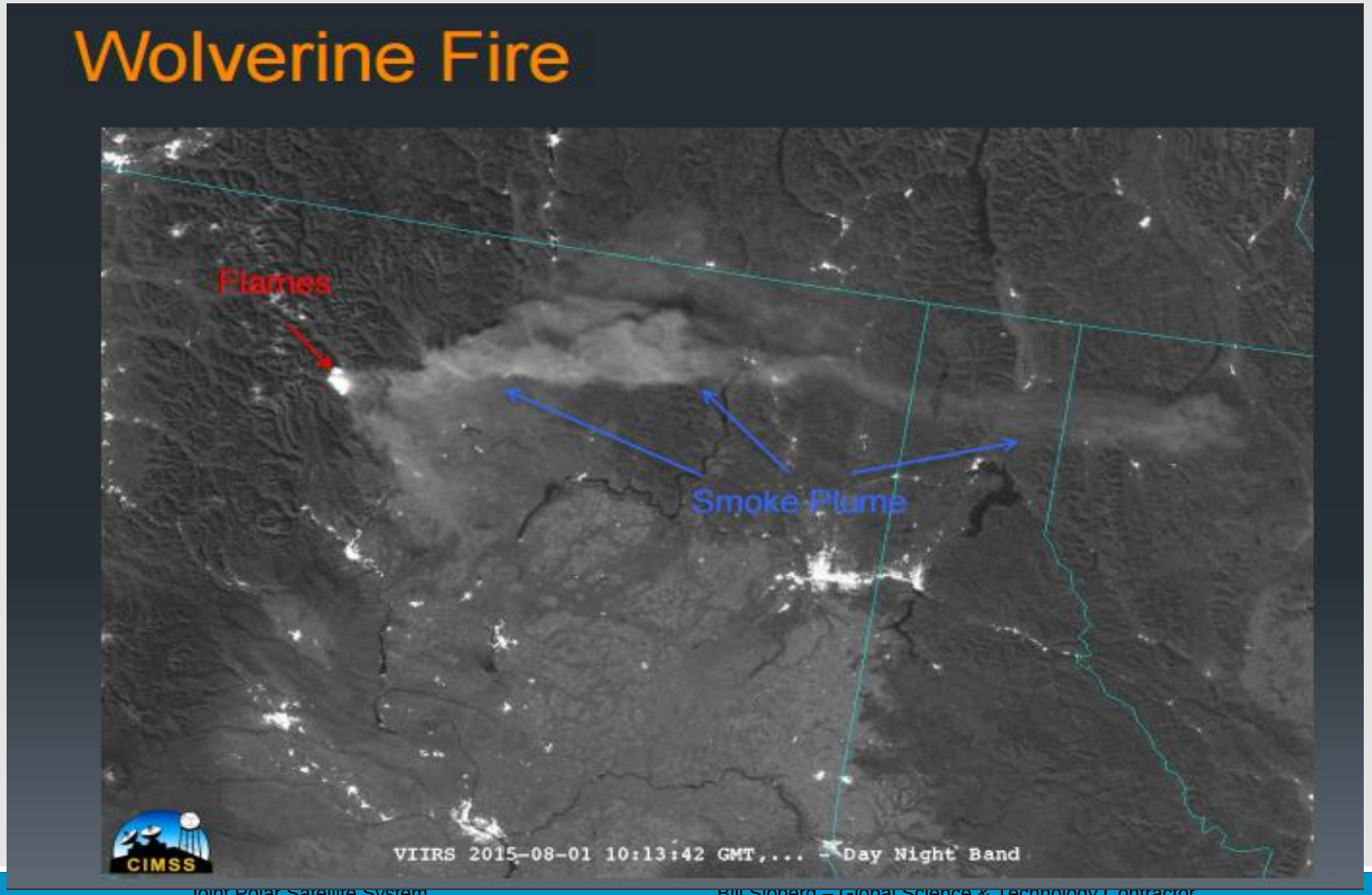
Initiative Activities

- Boots on the ground. Personnel visited fires to evaluate what environmental data is used and to provide info on JPSS fire support capabilities.
- Visited key stakeholders, Alaska Fire Service as an example, to help them access JPSS data and products consistently.
- Integrated VIIRS Active Fire and Fire Radiative Power as initial conditions for the HRRR Smoke Model.
- Integrated Air Quality (AQ) specialists into the Initiative Team to ensure AQ issues are addressed.
- Briefed at the last three NWS IMET Conferences to go through with participants the products available on AWIPS Thin Client and new initiatives.
- Evaluated JPSS Products during key fire events such as the Rim Fire in CA, the Fort McMurray Fire in Canada, and 2018 Western Region Fires.
- Welcomed developers for various smoke models, Blue Smoke as an example, to participate in the F&S Initiative Team to determine how VIIRS could be used in their models.
- And more……..

King Fire Sep 2014
Views via SNPP VIIRS DNB Night Time Visible



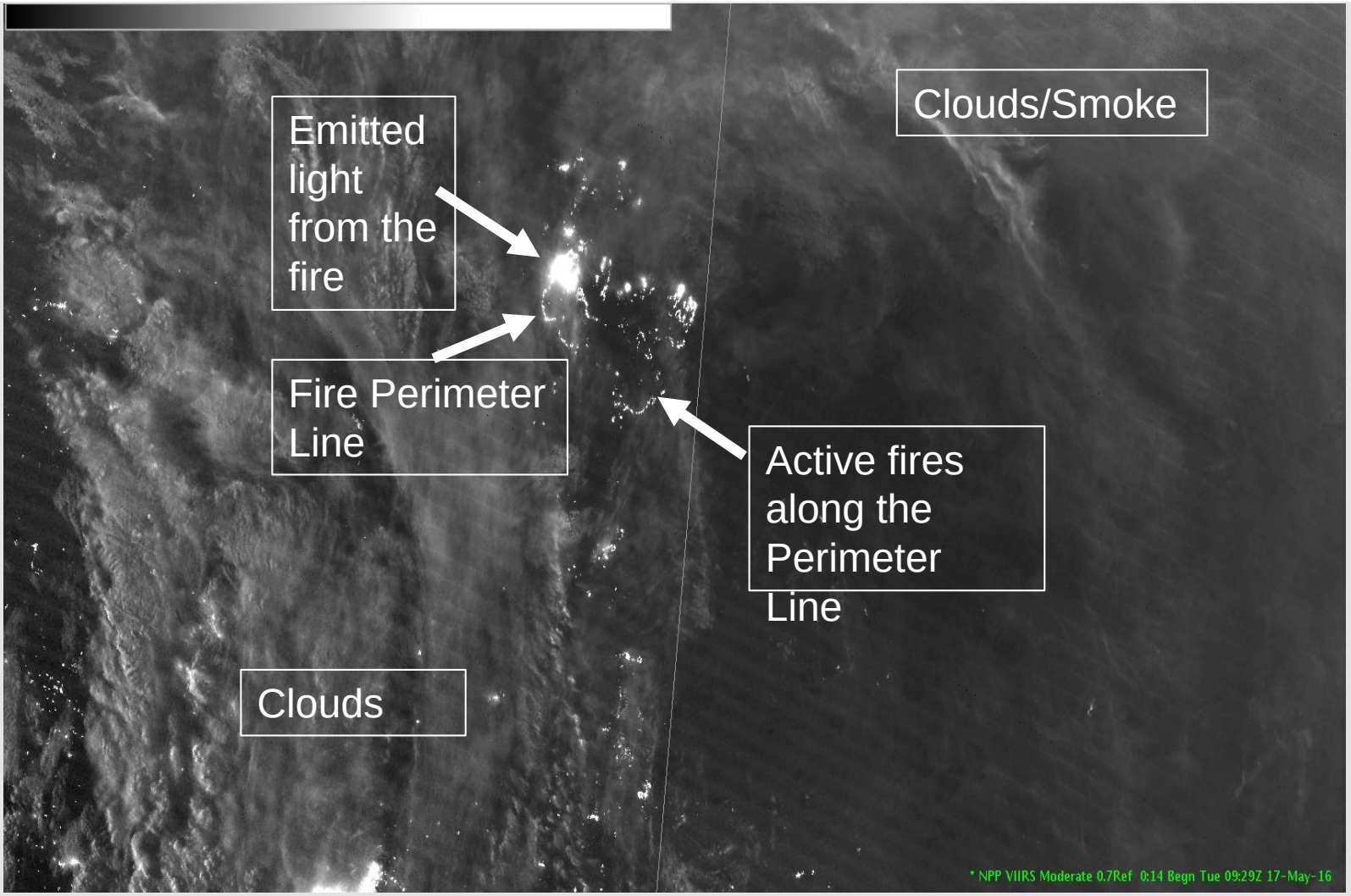
Western Washington State
1 Aug 2015



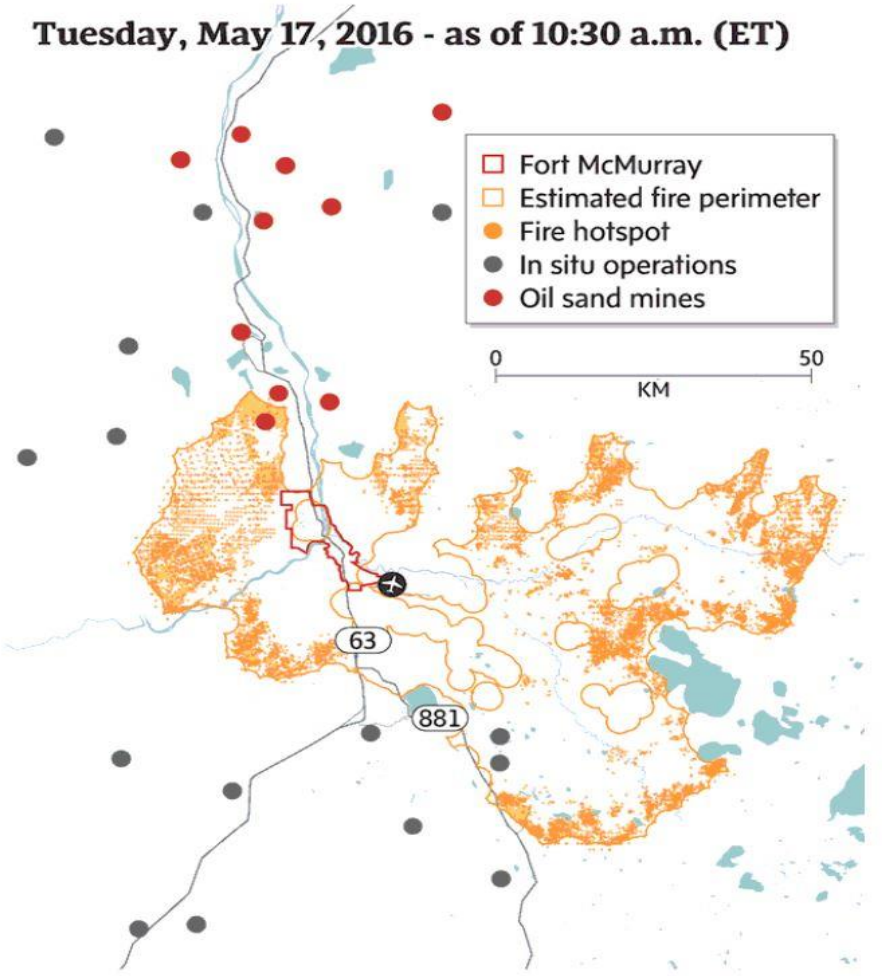
THE FORT MCMURRAY WILDFIRE MAY 2016

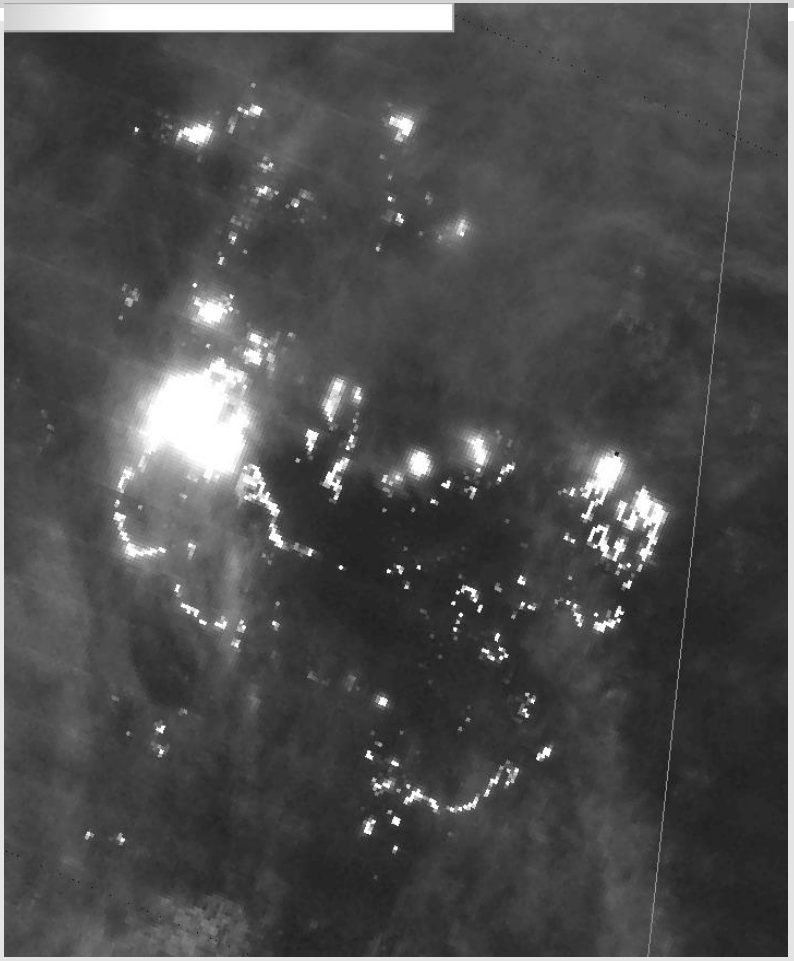
Image: Ft. McMurray Wildfire as it spreads across the Alberta landscape
Source: Public Service Alliance of Canada

NCC Imagery of Ft McMurray Wildfire 17 May at 0930 UTC



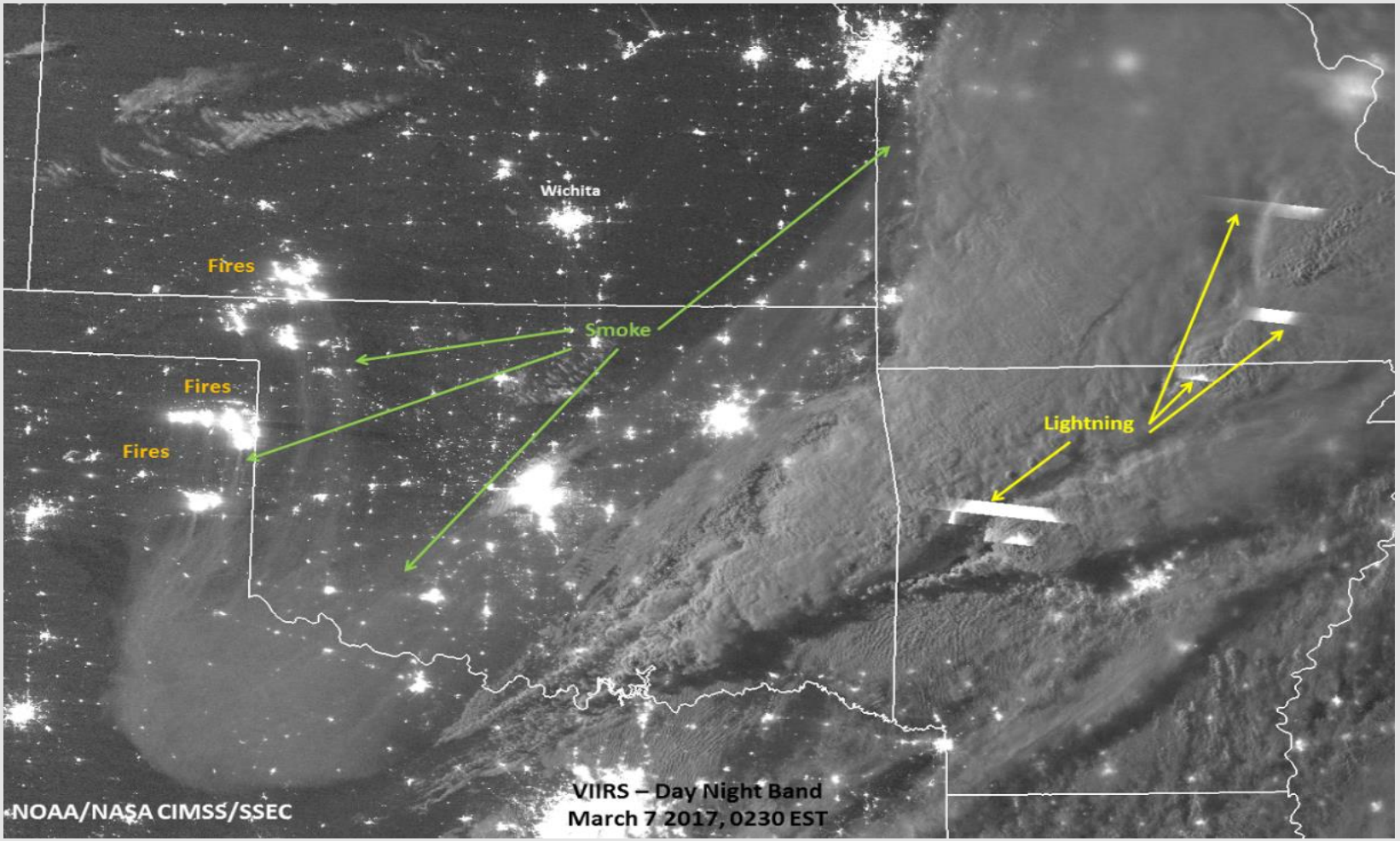
NCC Imagery 17 May 2016 at 0929Z (i.e., 05:29 a.m. ET)



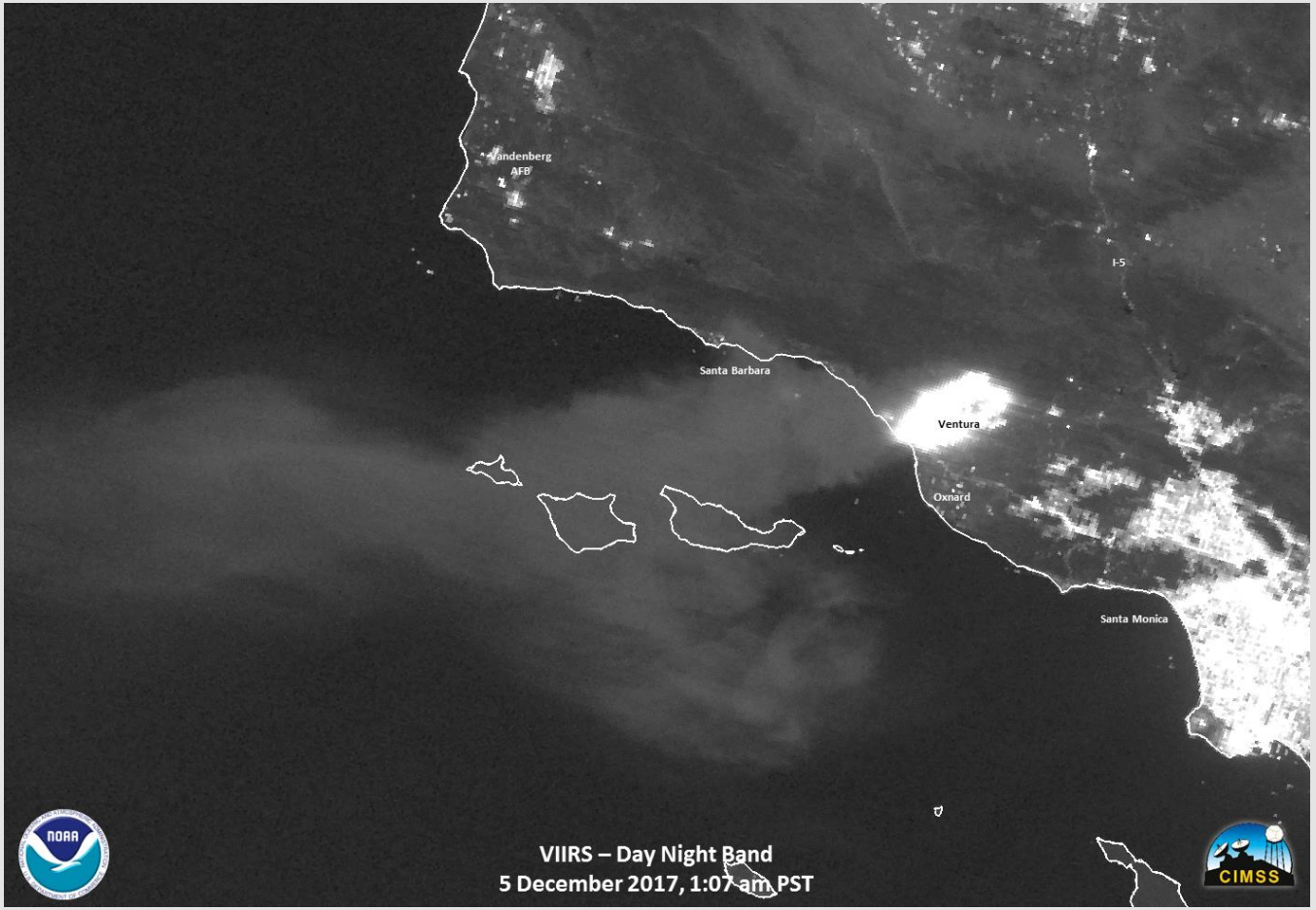


COMPARISON BETWEEN ESTIMATED FIRE PERIMETER AND NCC IMAGERY

Oklahoma Fires – 7 Mar 2017

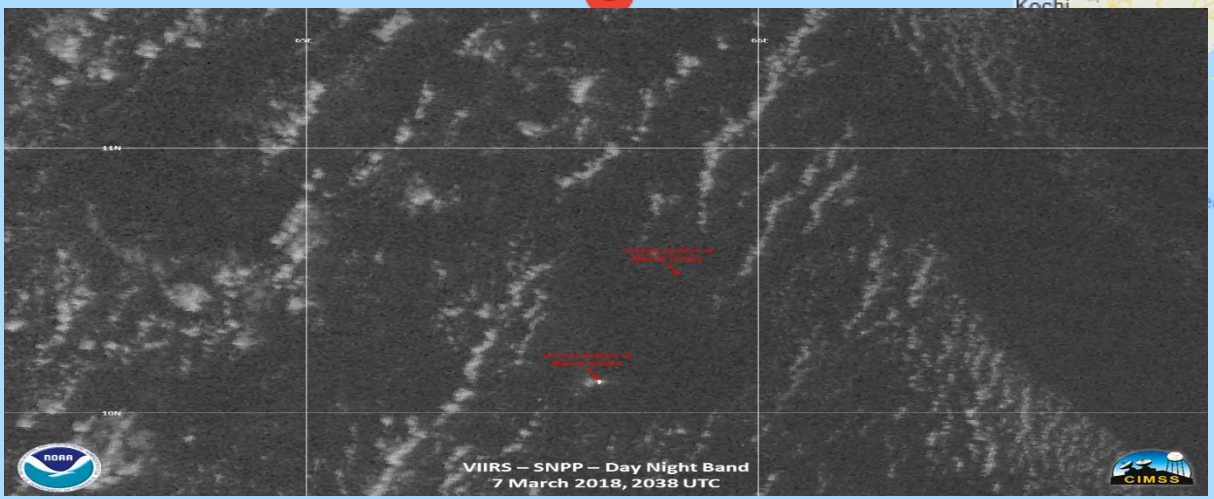


Thomas Fire – California
Day Night Band



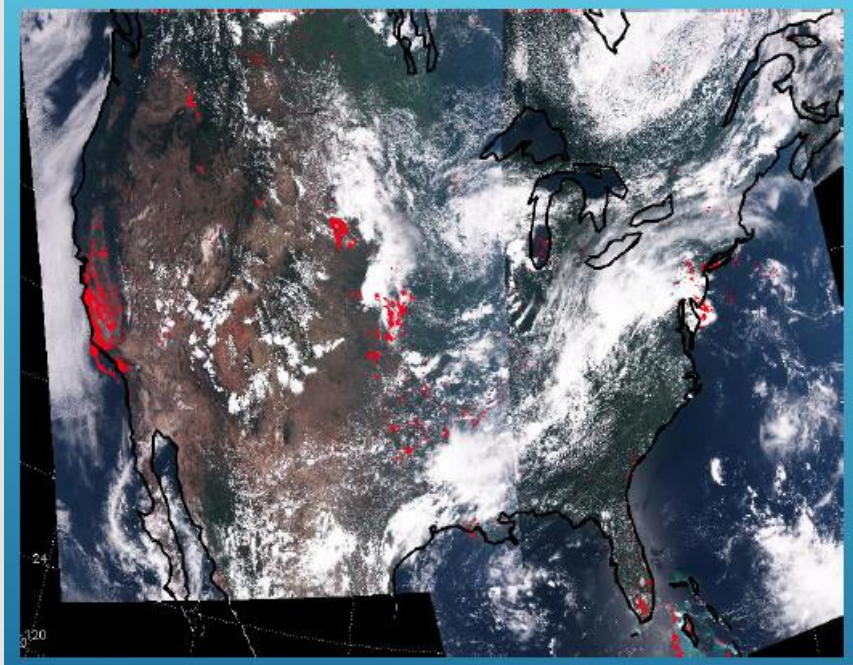
Container Ship Maersk Honam on Fire 7 Mar 2018

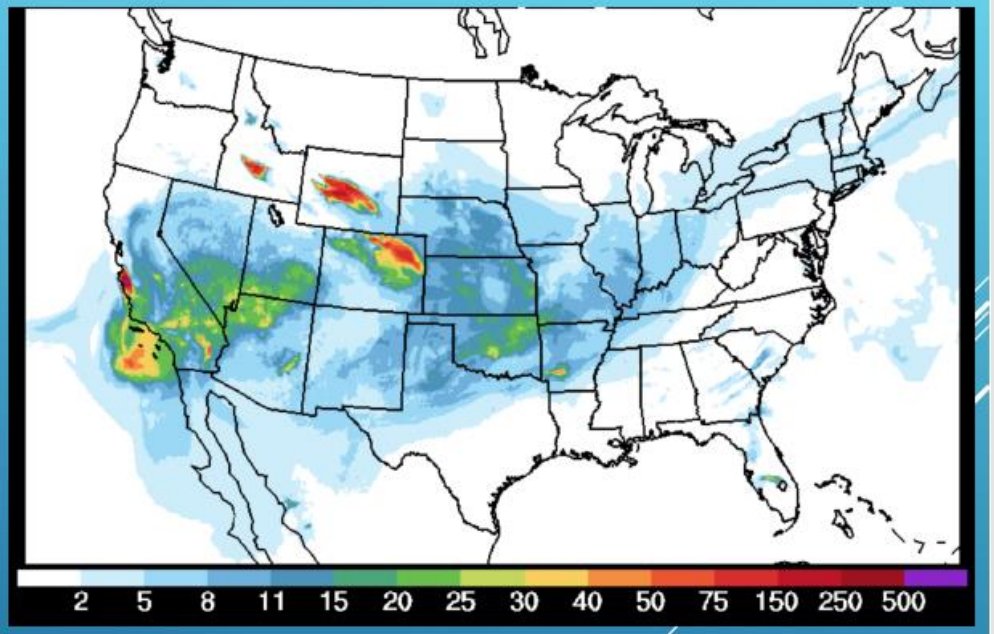
Major Fire on Ultra-Large Containership Maersk Honam in Arabian Sea
1 dead, 4 still missing



Early HRRR-Model Output

VIIRS smoke mask and HRRR-Smoke forecast for vertically integrated smoke, July 28 2016





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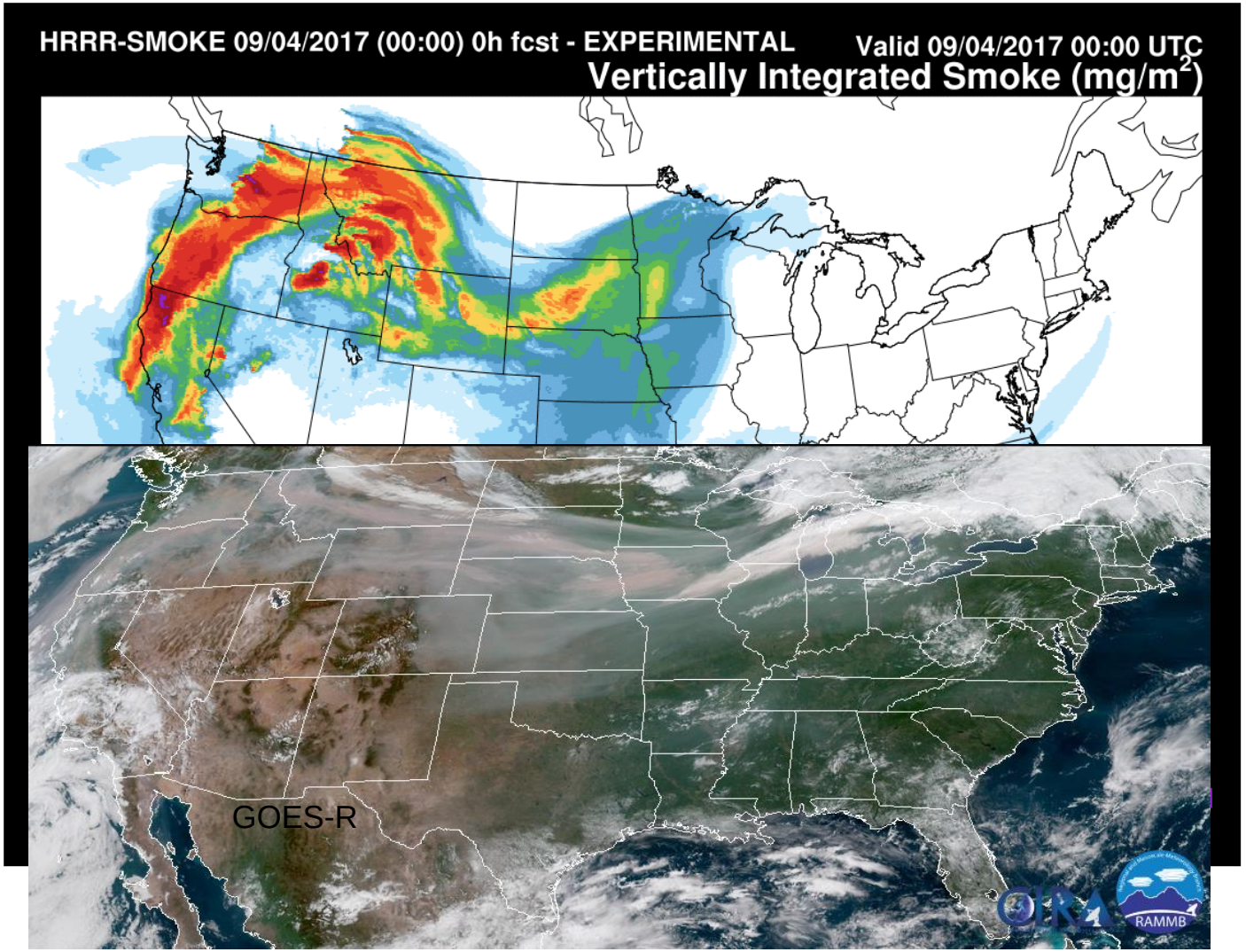
HRRR – Smoke Model Updated Version

https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/



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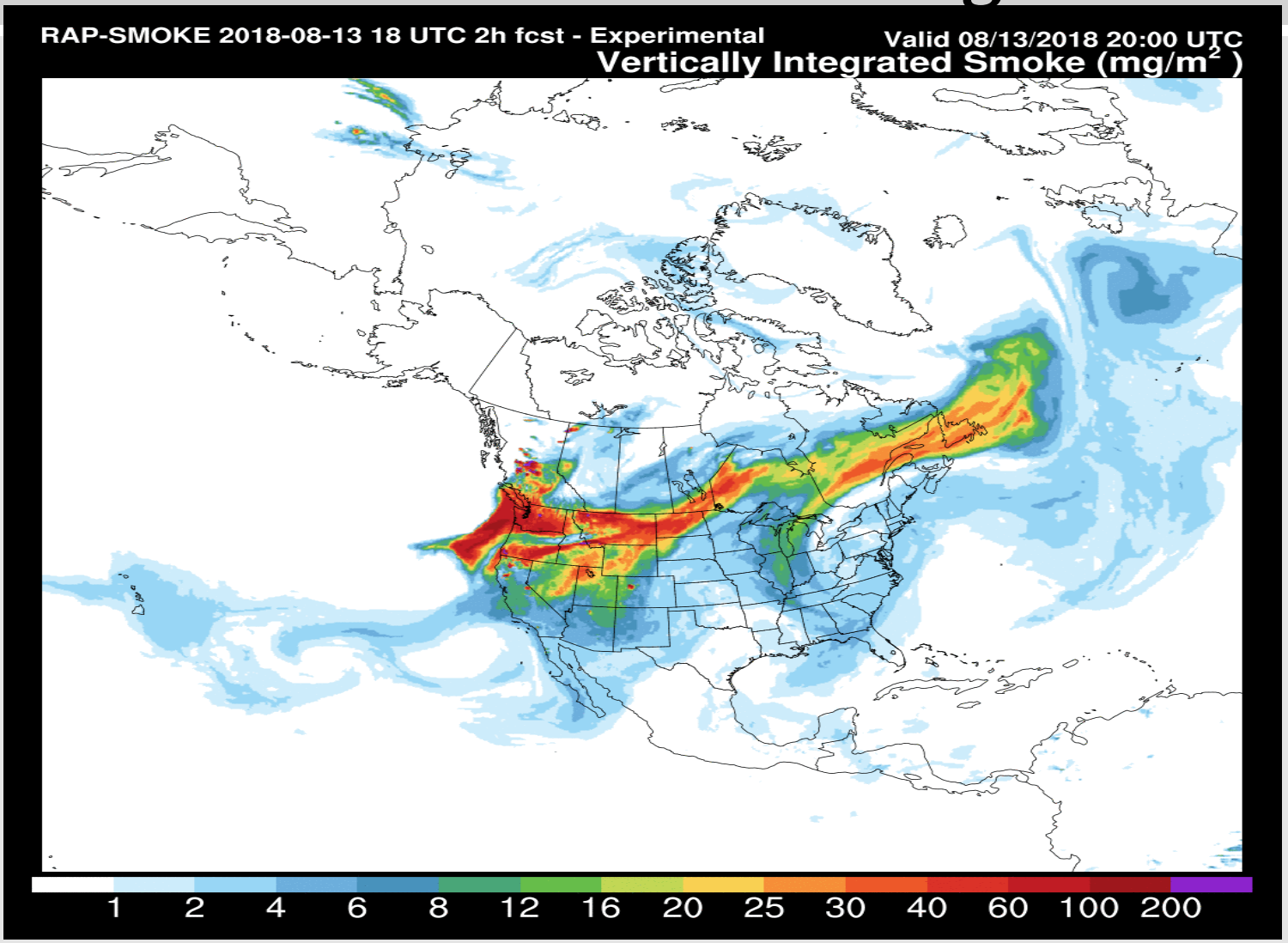
RAP Model Provides More Smoke Forecast Coverage



Fire Smoke Models in Use
Rick Graw AQ Pgm Mgr
USDA Forest Service

Model Component	Blue Sky Daily Operational Runs (v3.5.1)	HRRR Smoke	FireWork	AIRPACT 5	NOAA/NWS National Air Quality Forecast	Comments
Purpose	Simulate the emissions, transport, and concentration of smoke from wildfire and prescribed fire.	Addresses the need for a coupled meteorological-wildfire smoke forecast model.	To provide numerical guidance (PM2.5 concentrations) to forecasters for inclusion of biomass burning.	Provide timely air quality information to people in the Pacific Northwest region.	Provide next day operational predications for ground level ozone, smoke, and dust	
Products	Surface levels of PM2.5: • hourly • 3-hr • 24-hour: • daily 1 hr max	• Fire radiative power • Near-surface smoke • Vertically-integrated smoke • 10m wind • 1hr precipitation • 2 m temperature	PM2.5 (from biomass burning emissions) Ground level: • 24 and 48 hour avg. • 1-hr max Total column	Surface PM2.5 Surface Ozone N and S Deposition	HYSPLIT Smoke and Dust • Surface • Vertical Integration CMAQ : • Surface Ozone (does not include gaseous emissions from wildfires). • 1-hr and 24-hr total PM2.5 (& bias corrected):	Daily average PM2.5 is helpful for comparison with EPA AQI which is also 24-hr avg.
Domain	Variable from Canada and CONUS, to sub-regions.	Continental US (CONUS)	North America	Washington, Oregon, Idaho, and parts of MT, CA, NV, UT, and WY	HYSPLIT smoke: North America CMAQ PM2.5 with smoke emissions: CONUS,	
Frequency of runs	Once a day for WRF. Twice a day for the NAM domains (00z and 12Z) Up to 4x/day for the NAM 1 km domains	Four times a day Every 6 hours (00, 06, 12 and 18 Z)	Twice daily: 00z and 12z	Once per day.	HYSPLIT: 1/day (06Z) CMAQ: 2/day (06Z, 12Z)	
Forecast period	36 hours (1 km variable) 60 hours (1.33 km PNW) 72 hours (4 km PNW) 84 hours (12 km CONUS) 48 hours (3 km CONUS) 5 days for 0.5 degrees	36 hours	48 hours	48 hours	48 hours	
Website	https://www.airfire.org/data/bluesky-daily/	https://rapidrefresh.noaa.gov/hrrr/HRRRsmoke/	http://weather.gc.ca/firework Development site (pw)	http://www.lar.wsu.edu/airpact/gmap/ap5/ap5smoke.html	http://airquality.weather.gov/ CMAQ PM: http://www.emc.ncep.noaa.gov/mmb/aq/	
Contact	Susan O'Neill (206) 73207851 smoneill@fs.fed.us	Ravan Ahmadov (303) 497-4314 ravan.ahmadov@noaa.gov	Radenko Pavlovic radenko.pavlovic@canada.ca Jack Chen (613) 991-9459 Jack.chen@canada.ca	Farren Herron-Thorpe (360) 407-7658 fher461@ecy.wa.gov	Ivanka Stajner ivanka.stajner@noaa.gov Jeff McQueen: jeff.mcqueen@noaa.gov	

Future Satellite Support to the Fire Mission

- *Fully implement GOES-17 and NOAA-20 Fire Products*
- *Continue to reach out to current users and potential users to work with them to evaluate satellite capabilities. User feedback to guide future decisions.*
- *Keep IMETs, Air Quality personnel, and others informed of continued work and provide training on products*
- *Respond to requests for satellite fire and smoke capabilities during fire events*
- *Look for additional opportunities to blend JPSS/GOES-R capabilities*
- *Smoke Modeling*
  - *Add other satellite (NOAA-20, GOES-R...) fire products to the HRRR-Smoke Model*
  - *Help transition the smoke parameterization into the global FV3 in the future in synergy with EMC and ARL*

For More Information on the JPSS Program (WWW.JPSS.NOAA.GOV)